Coal Transportation Fuels

Federal Energy Technology Center
Product Office for Fuels & Specialty Markets

Presented by

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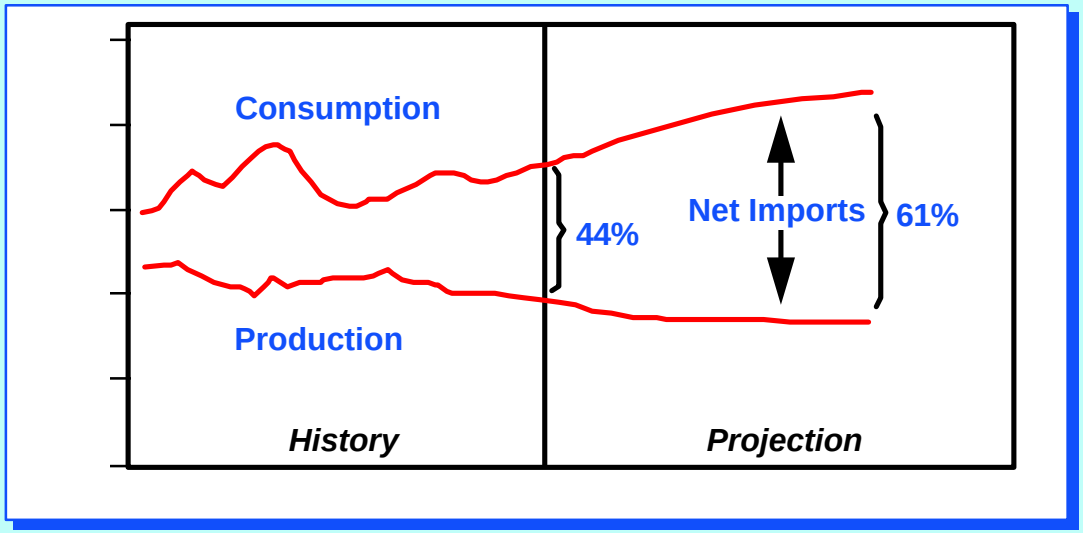
Overview

- Mission/Goals
- Products
- Drivers
- Strategy
- Vision 21
- Pioneer Plant
- Roadmap
- Where Does University Research Fit?

Mission

- **Help the United States secure an affordable energy supply by fostering the development and deployment of technologies to produce low-emission, coal-derived fuels and chemicals that can compete with those produced from oil.**



Goal

- **Provide environmentally superior coal-based transportation fuels and chemical feedstocks that can compete with petroleum crude at $21 per barrel by the year 2015.**

Fuel Systems Products

- FT Diesel
- Methanol
- Other Oxygenates
- Hydrogen/Synthesis Gas
- High-Performance Jet Fuel
- Other Clean Fuels

- Slurry Bubble Column Fischer-Tropsch Synthesis
- Multi-Stage Dispersed Catalyst Direct Liquefaction

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Benefits / Drivers

- **Environment**
  - Produce extremely high quality, cost-competitive low-emission fuels
  - Create concentrated stream of CO_2
  - Process a broad range of feedstocks

	Coal-Derived Gasoline	Petroleum-Derived Gasoline	CARB Goal (2000)
Sulfur (ppm)	**10**	**338**	**30**
Aromatics (v%)	**7**	**28**	**22**
Benzene (v%)	**0.3**	**1.6**	**0.8**
Olefins (v%)	**<1**	**10**	**4.0**

Benefits / Drivers

- **Environment**

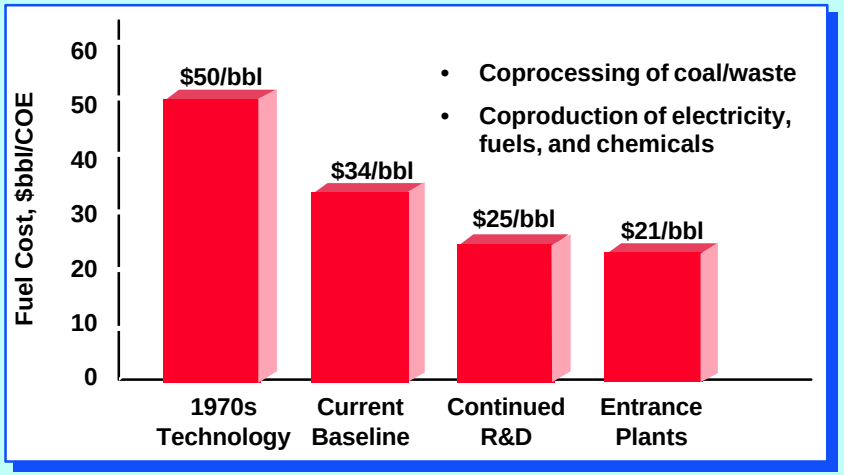
FT Diesel Emissions Reduction Relative to Petroleum Diesel Fuels

SO_x	100%
CO	46%
Hydrocarbons	38%
Particulates	30%
NO_x	9%

Benefits / Drivers

Economy

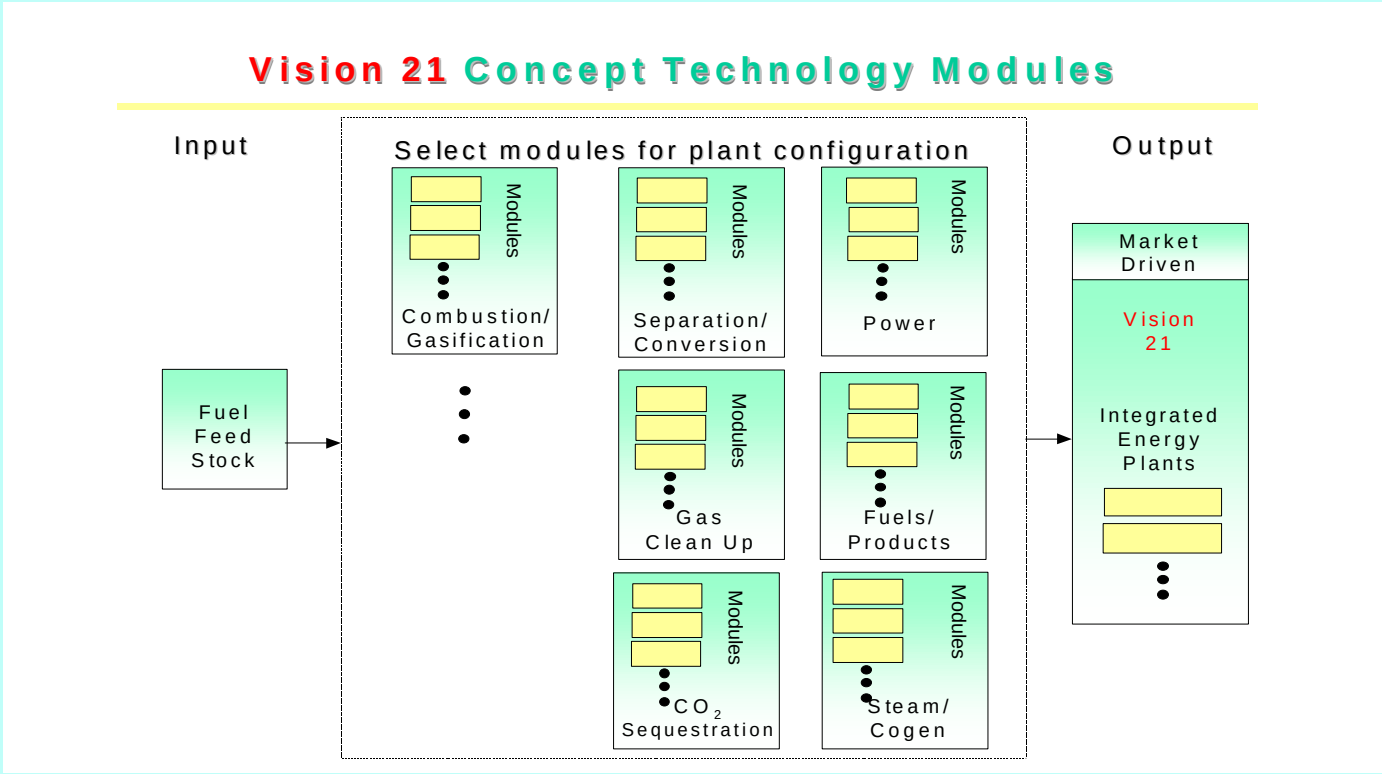
- By 2015, increase employment by 300,000 for every 1MM bpd production
- Be competitive with IEA's projected 2015 $21/bbl cost for imported oil
- Reduce trade deficit due to oil imports; projected to be approx. $120B annually by 2015



Strategies

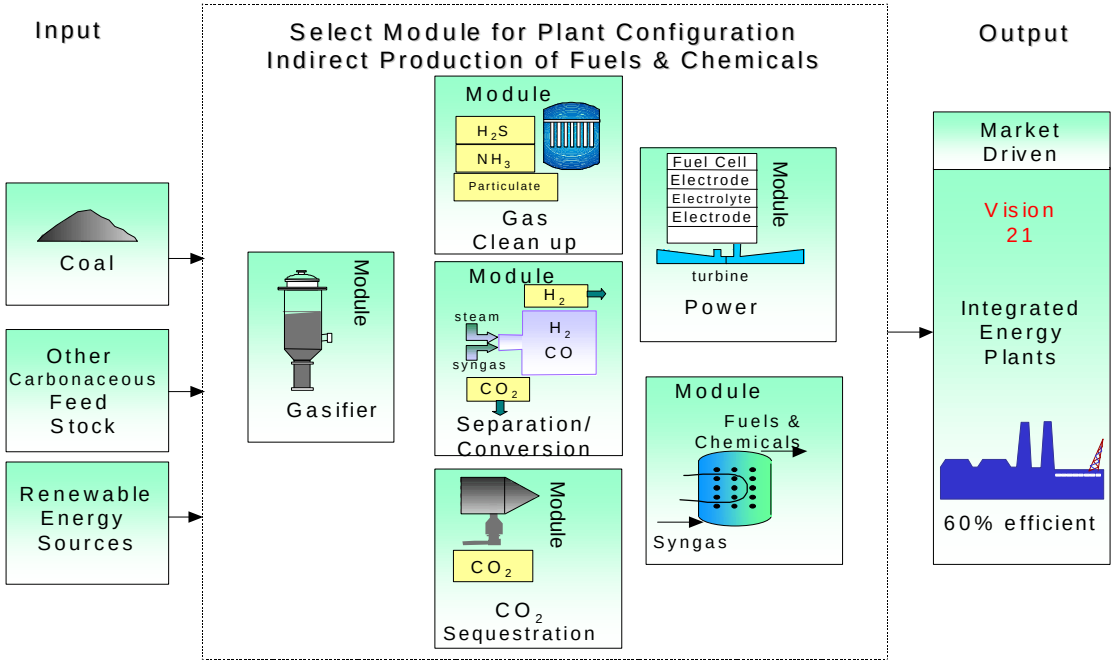
- Government / Industry / University Partnerships
- Collaboration with Engine Developers
- Market Opportunities
- Pioneer Plant
- Vision 21

VISION 21
GENERAL SCENARIO



VISION 21
INDIRECT PRODUCTION OF FUELS AND CHEMICALS

Example of Vision 21 Concept Technology Modules



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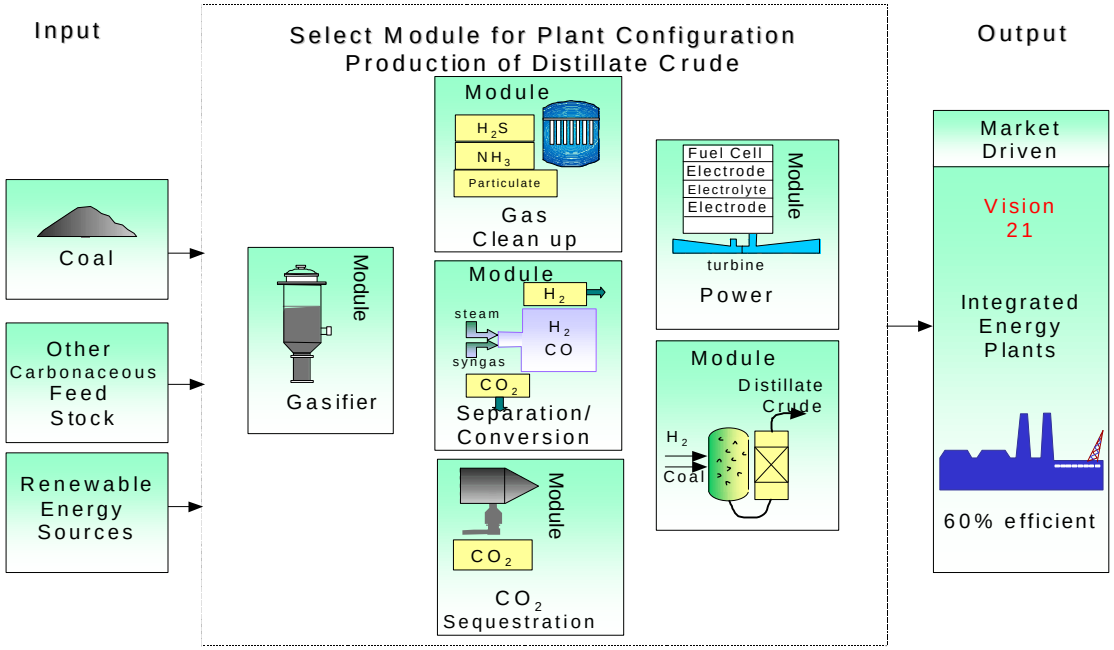
VISION 21
PRODUCTION OF DISTILLATE CRUDE

Example of Vision 21 Concept Technology Modules



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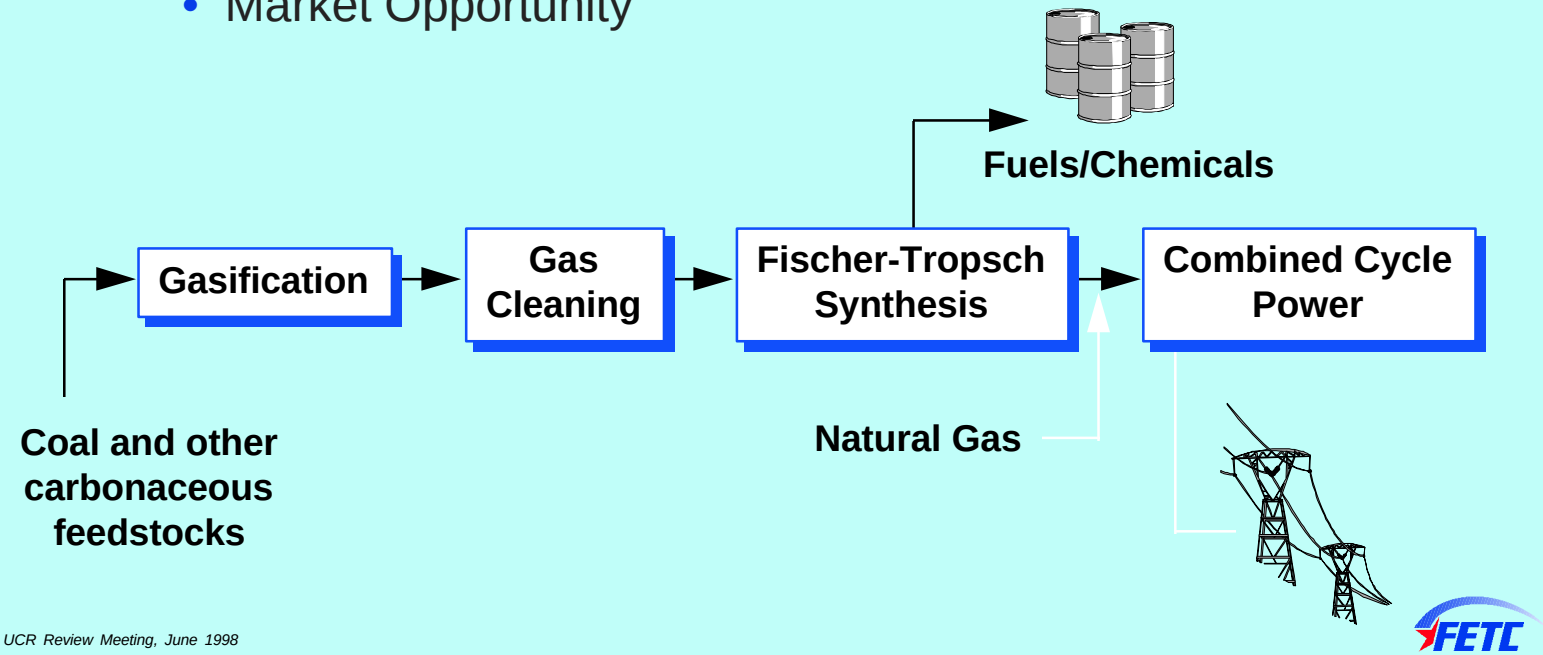
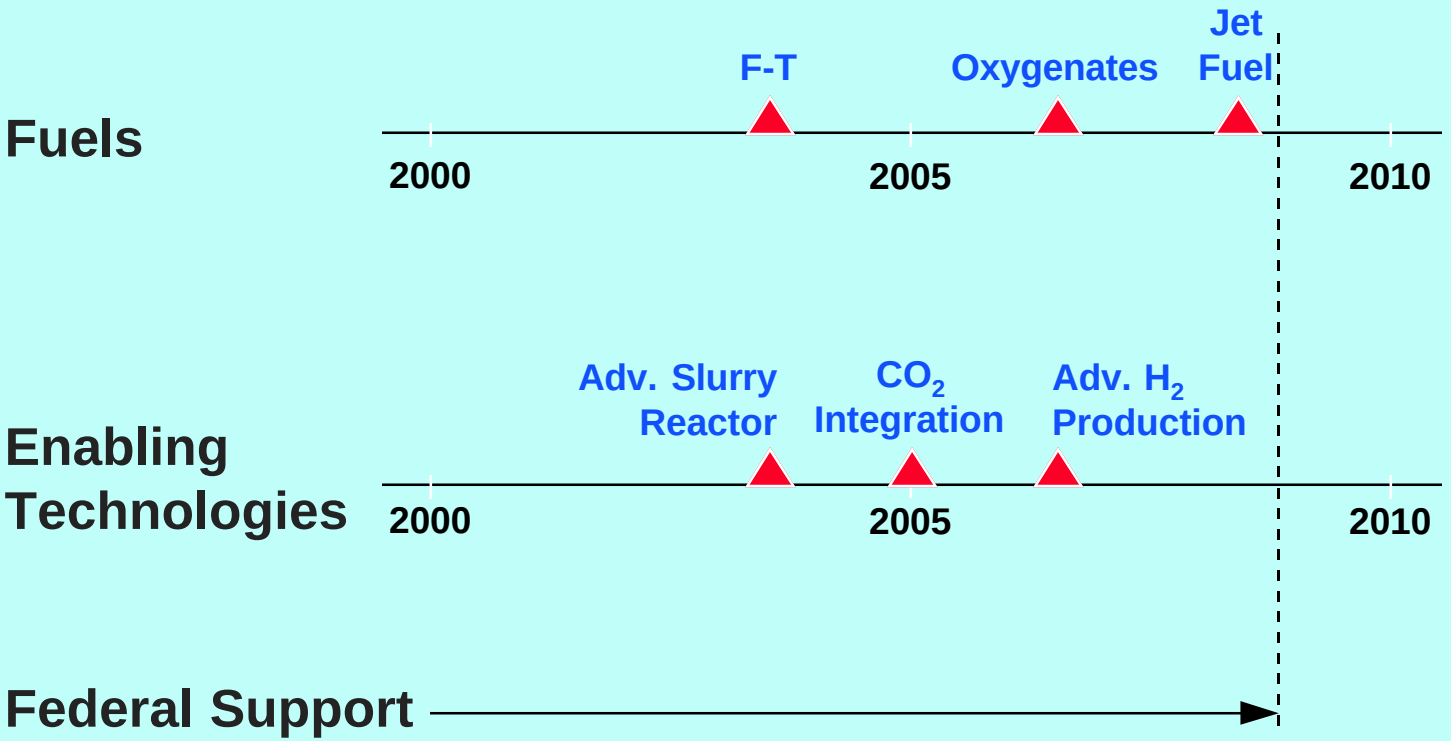
Major Program Thrusts

- **Pioneer Plant**
  - Early, simple Vision 21 facility
  - Market Opportunity



Schedule: POC Verification



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Program Activities - Technology Roadmap

Feedstock Conversion	H_2 Utilization	Process R&D	Co-proc/Co-prod	Optimal H_2 Eff
	Catalyst Dev/R&D	Molecular Computer Sim		High Prod Sel Cat
Reactor/ Process Development	Reactor Hydrodynamics/Design		POC Scale-up	Pioneer Plant
	Process Integration	Feas Study	Eng Dev	Ref Integration
Separation Processes	Sol/Liq Sep	Novel Catalyst/Wax Separations		Clean Product
	Gas Separation	Membrane Reactor Dev		Econ H_2/Syngas
Product Upgrading	Refinery Integration			Refinery Acceptance
	Prod Char	Product Prep, Upgrade, Engine Test		Spec Fuels
Environmental Management	CO_2 LCA	Process Efficiency & Sequestration		Sequester/Use CO_2
	BOP Emissions LCA	Waste Minimization		Near Zero Emissions

Products			
	Fuel Additives / Extenders	Commercial FT Diesel	Automotive Flex Fuel
	Research Transportation Fuels	C Products & Feedstocks	Research Jet Fuel

Committed Caution Critical for Future

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Relationship to Advanced Research Programs

- **Enabling Technology**
  - Hydrogen
  - CO_2 Sequestration
- **Visionary Science**
  - Computer-aided chemistry and engineering
  - Step-out Technologies
- **Partnerships**

Summary

- FETC Fuels Program is product oriented
- Environmental Drivers are very important
- Short, intermediate and long-term products
- Includes highly efficient, energyplex concept
- Universities critical for developing enabling and visionary technologies
- University/Government/Industry R&D partnering expected to yield maximum results